(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization

International Bureau

(43) International Publication Date 12 February 2004 (12.02.2004)



(10) International Publication Number WO 2004/013062 A2

(GB).

(51) International Patent Classification7:

C03C 17/00

R. [GB/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB).

(21) International Application Number:

PCT/GB2003/003397

(22) International Filing Date: 4 August 2003 (04.08.2003)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

0217990.1

2 August 2002 (02.08.2002)

(71) Applicant (for all designated States except US): IM-PERIAL COLLEGE INNOVATIONS LIMITED [GB/GB]; Sherfield Building, Exhibition Road, London SW7 2AZ (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): PALOMARES GIL, Emilio [ES/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). CLIFFORD, John, N. [IE/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). HAQUE, Saif, A. [GB/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). LUTZ, Thierry [FR/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). DURRANT, James, (74) Agent: BODEN, Kelth, McMurray; Fry Heath & Spence LLP, The Gables, Massetts Road, Horley, Surrey RH6 7DQ

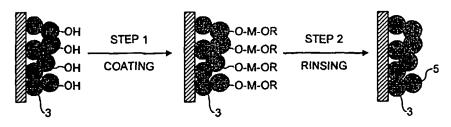
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GO, GW, ML, MR, NE, SN, TD, TG).

Published:

without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LOW-TEMPERATURE METAL OXIDE COATING



(57) Abstract: A low-temperature fabrication method for fabricating a conformal metal oxide coating on a substrate, the method comprising the steps of, coating a surface of a substrate with a non-hydrolysed precursor solution of one or more moisture-sensitive metal alkoxides in an organic solvent at a temperature of less than 150 °C; and rinsing the precursor solution coated on the surface of the substrate in water at a temperature of less than 150 °C to hydrolyse precursor solution at the surface of the substrate and thereby form a conformal metal oxide coating on the substrate.

2004/013062 A2



PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference FOR FURTHER see Notification of Transmittal of International Search Report				
(Form PCT/ISA/220) as well as, where applicable, item 5 below. P58700B (WO) ACTION				
International application No.	International filing date (day/mont	h/year) (Earliest)	Priority Date (day/month/year)	
PCT/GB 03/03397	04/08/2003		02/08/2002	
Applicant				
IMPERIAL COLLEGE INNOVATION	ONS LIMITED			
This International Search Report has been according to Article 18. A copy is being tra			transmitted to the applicant	
This International Search Report consists X	of a total of sh a copy of each prior art document of			
	E)			
Basis of the report				
 With regard to the language, the language in which it was filed, unit 	international search was carried ou less otherwise indicated under this i		ernational application in the	
the international search w Authority (Rule 23.1(b)).	vas carried out on the basis of a trar	slation of the internation	onal application furnished to this	
contained in the international application in written form.				
filed together with the inte	ernational application in computer re	adable form.		
furnished subsequently to	this Authority in written form.			
furnished subsequently to	this Authority in computer readble	form.		
	the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.			
the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished			o the written sequence listing has been	
2. Certain claims were found unsearchable (See Box I).				
3. Unity of invention is lac	3. Unity of invention is lacking (see Box II).			
4. With regard to the title ,				
X the text is approved as submitted by the applicant.				
the text has been established by this Authority to read as follows:				
hd	•			
5. With regard to the abstract,				
X the text is approved as submitted by the applicant.				
the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of malling of this international search report, submit comments to this Authority.				
6. The figure of the drawings to be pub			1	
X as suggested by the appli		•	None of the figures.	
because the applicant fall	r characterizes the invention.			
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International Application No
PCT/GB 03/03397

A. CLASSII IPC 7	FICATION OF SUBJECT MATTER C23C18/12 H05K3/28 C03C17/2	25 H01L51/20 H01G9/20	
According to	International Patent Classification (IPC) or to both national classification	alion and IPC	
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	ion searched other than minimum documentation to the extent that s		
	ala base consulted during the international search (name of data basternal, WPI Data, INSPEC	as and, whole practical, search terms used)	
C. DOCUM	ENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the rel	evant passages Relevant to claim No.	
X	PALOMARES EMILIO ET AL: "Slow cherecombination in dye-sensitised scells (DSSC) using Al203 coated rTi02 films." CHEMICAL COMMUNICATIONS (CAMBRIDGENGLAND) 21 JUL 2002, no. 14, 21 July 2002 (2002-07-21), pages 1464-1465, XP002283754 ISSN: 1359-7345 the whole document	solar nanoporous	
X Funt	her documents are listed in the continuation of box C.	Patent family members are listed in annex.	
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but		'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention 'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone 'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. '&' document member of the same patent family	
	actual completion of the international search	Date of mailing of the international search report	
8	June 2004	28/06/2004	
Name and	Name and mailing address of the ISA European Patent Office, P.B. 5816 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016 Authorized officer Authorized officer Joffreau, P-0		



International Application No
PCT/GB 03/03397

		PCT/GB 03/03397
C.(Continu	ation) DOCUMENTS CONSIDERED TO BE RELEVANT	
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ICHINOSE I., SENZU H., KUNITAKE T.: "Stepwise Adsorption of Metal Alkoxydes on Hydrolyzed Surfaces: A Surface Sol-Gel Process" CHEMISTRY LETTERS, vol. 25, no. 10, 1996, pages 831-832, XP002283755 the whole document	1-54, 61-74
X	ICHINOSE I ET AL: "A SURFACE SOL-GEL PROCESS OF TIO2 AND OTHER METAL OXIDE FILMS WITH MOLECULAR PRECISION" CHEMISTRY OF MATERIALS, AMERICAN CHEMICAL SOCIETY, WASHINGTON, US, vol. 9, no. 6, 1 June 1997 (1997-06-01), pages 1296-1298, XP000659326 ISSN: 0897-4756 cited in the application the whole document	1-54, 61-74
X	KAY A ET AL: "DYE-SENSITIZED CORE-SHELL NANOCRYSTALS: IMPROVED EFFICIENCY OF MESOPOROUS TIN OXIDE ELECTRODES COATED WITH A THIN LAYER OF AN INSULATING OXIDE" CHEMISTRY OF MATERIALS, AMERICAN CHEMICAL SOCIETY, WASHINGTON, US, vol. 14, no. 7, July 2002 (2002-07), pages 2930-2935, XP001190713 ISSN: 0897-4756 the whole document	55-58,60
X	TENNAKONE K ET AL: "Dye-sensitized solid-state photovoltaic cells: suppression of electron-hole recombination by deposition of the dye on a thin insulating film in contact with a semiconductor" J. ELECTRON. MATER. (USA), JOURNAL OF ELECTRONIC MATERIALS, AUG. 2001, TMS; IEEE, USA, vol. 30, no. 8, August 2001 (2001-08), pages 992-996, XP002283756 ISSN: 0361-5235 the whole document	55-58,60



International Application No
PCT/GR 03/03397

	PCT/GB 03/03397	
(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
ory ° Citation of document, with Indication, where appropriate, of the relevan	passages Relevant to claim No.	
PALOMARES EMILIO ET AL: "Control of charge recombination dynamics in dy sensitized solar cells by the use of conformally deposited metal oxide blayers." JOURNAL OF THE AMERICAN CHEMICAL SO 15 JAN 2003, vol. 125, no. 2, 15 January 2003 (2003-01-15), pages 475-482, XP002283757 ISSN: 0002-7863 page 476, left-hand column, paragraph right-hand column, paragraph age 477, left-hand column, paragraph age 479, right-hand column, last paragraph - page 480, left-hand col paragraph 1; table 2	f 1-74 F locking CIETY. ph 2 - le 1 ph 2	

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(10) International Publication Number WO 2004/013062 A3

- (51) International Patent Classification⁷: C23C 18/12, H05K 3/28, C03C 17/25, H01L 51/20, H01G 9/20
- (21) International Application Number:

PCT/GB2003/003397

- (22) International Filing Date: 4 August 2003 (04.08.2003)
- (25) Filing Language:

English

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English

(30) Priority Data: 0217990.1

2 August 2002 (02.08.2002) GB

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- (75) Inventors/Applicants (for US only): PALOMARES GIL, Emilio [ES/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). CLIFFORD, John, N. [IE/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). HAQUE, Saif, A. [GB/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). LUTZ, Thierry [FR/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB). DURRANT, James, R. [GB/GB]; Department Of Chemistry, Imperial College London, South Kensington, London SW7 2AY (GB).

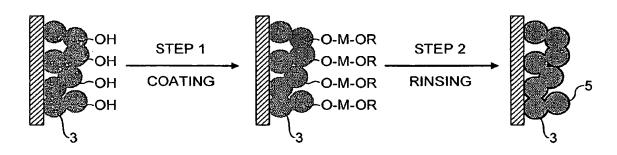
- (74) Agent: BODEN, Keith, McMurray; Fry Heath & Spence LLP, The Gables, Massetts Road, Horley, Surrey RH6 7DQ (GB).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report: 12 August 2004

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A. CLASSI IPC 7	FICATION OF SUBJECT MATTER C23C18/12 H05K3/28 C	03C17/25	H01L51/20	H01G9/20
According to	International Patent Classification (IPC) or to both nation	onal classification ar	nd IPC	
B. FIELDS	SEARCHED			
Minimum do IPC 7	cumentation searched (classification system followed to C23C H05K C03C H01L H01	2	pols)	
Documentat	ion searched other than minimum documentation to the	extent that such do	cuments are included li	n the fields searched
	ata base consulted during the international search (name ternal, WPI Data, INSPEC	1e of data base and,	where practical, searc	h terms used)
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X Furti	her documents are listed in the continuation of box C.		Patent family membe	rs are listed in annex.
 Special categories of cited documents: A' document defining the general state of the art which is not considered to be of particular relevance E' earlier document but published on or after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention filing date 'X' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) 'C' document referring to an oral disclosure, use, exhibition or other means 'P' document published prior to the International filing date but later than the priority date claimed Date of the actual completion of the international search 'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. '&' document member of the same patent family Date of mailing of the international search report 		a conflict with the application but vinciple or theory underlying the evance; the claimed invention vel or cannot be considered to when the document is taken alone evance; the claimed invention involve an inventive step when the itth one or more other such docu- to being obvious to a person skilled same patent family		
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Name and r	nailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Au	uthorized officer Joffreau, I	o-0





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C.{Continu	etion) DOCUMENTS CONSIDERED TO BE RELEVANT	
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C.(Continuation) DOCUMENTS CONSIDERE		LO slovent to claim No.
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X,P PALOMARES EMILION charge recombinations sensitized solar conformally deportance." JOURNAL OF THE ALIST JAN 2003, vol. 125, no. 2 15 January 2003 475-482, XP00220 ISSN: 0002-7863 page 476, left-heright-hand columpage 477, left-left-left-left-left-left-left-left-	(2003-01-15), pages 83757 nand column, paragraph 2 - mn, paragraph 2; table 1 nand column, paragraph 2 -hand column, last e 480, left-hand column,	Relevant to claim No. 1-74